

A COMPARISON OF ACCOUNTANTS' AND ENGINEERS' CONCEPTS
OF DEPRECIATION AND APPRECIATION

by

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INTRODUCTION

Frequently, in accounting classes, an instructor or student says, that his is the accountant's idea of depreciation or it may be of appreciation. This implies that there are others whose ideas regarding these two subjects are different.

Engineers comprise one group whose ideas on some phases of the two subjects are different. Engineers also have to deal with appreciation and depreciation; and they have certain definite ideas regarding these two subjects.

The purpose of this study has been to determine to what extent engineers and accountants are agreed in their concepts of depreciation and appreciation; and to determine to what extent their concepts of depreciation and appreciation differ; and, when possible to account for the differences.

In order to determine these differences investigation was carried on in two ways. A questionnaire was sent out to practitioners in the engineering and accounting fields. In addition, a review of the literature in the library on these two subjects was carefully made.

Questionnaires were sent out to equal numbers of accountants and engineers. These questionnaires covered the main problems of appreciation and depreciation.

An exhaustive survey was made of the literature on these two subjects in the Kansas State College library. Books and technical magazines in the accounting and engineering fields were reviewed, in order to find out the opinions held regarding depreciation and appreciation of machinery by the recognized writers in both professions.

CHAPTER I

Results From Questionnaire On Engineers' And Accountants' Concepts Of Depreciation Of Machinery

A questionnaire (see appendix A) was used in order to obtain the opinions of practitioners in the engineering and accounting fields. This questionnaire was sent to a selected list of public accountants and appraisal engineers.

It was important that the questionnaire should reach those best qualified to answer, as lack of financial means limited the number of questionnaires which could be sent out.

A survey was made of the engineering directory in several of the leading engineering magazines, and sixty firms were chosen who seemed to have the widest and most extensive practice. In some cases several questionnaires were sent to one important firm having branches in different cities.

A survey was also made of the leading industrial firms to find out who did their auditing. It was found that twelve accounting firms did the auditing for two hundred of the leading industrial concerns. To several branches of these leading accounting firms, as well as to several of the more important minor firms, sixty copies of this questionnaire were sent.

Those who answered the questionnaire seemed to do so in all seriousness, and in practically all the answers there was evidence of considerable thought. There were favorable comments on the questions asked. One accountant said, "I have just finished the season with Haskins & Sells, and these problems are continually rising in actual practice."

Results from Questionnaire. The following are the results from the twenty engineering and twenty accounting firms that replied.

Question 1. Check the following items which in your opinion should be included under the head of depreciation of machinery.

	Accountants	Engineers
Wear and tear	20	20
Climatic effects	15	11
Obsolescence	11	16
Disuse	7	10

Inadequacy	8	13
Accidents	4	7
Misuse	7	8
Action of elements	14	10

Twenty engineers and twenty accountants answered this first question. They were unanimous in agreement that wear and tear on machinery such as is caused by the ordinary every day use of a machine is a cause of depreciation. As this is the only cause of depreciation where all were agreed, it might be considered the major cause of depreciation.

Climatic effects is the next cause listed. This includes the effects of salty air, or of excessive moisture, or of any out of the ordinary climate. Fifteen accountants or eighty per cent of those replying listed this as a cause of depreciation of machinery, while only eleven engineers, a little better than half of those replying, listed this as a cause of depreciation.

Obsolescence has been variously defined but the meaning of the word is generally understood. Kester's definition: (1) "obsolescence is due to a changed demand for an article, or to an advance in the arts which makes the continual use of an asset uneconomical", is in line with the general idea. Eleven accountants included this in their causes of depreciation. The engineers attached more

importance to obsolescence as a factor in depreciation, sixteen engineers or eighty per cent of those replying included it as a cause. As obsolescence is usually included in a definition of depreciation found in text books, an almost unanimous decision in favor of obsolescence as a cause of depreciation of machinery was expected.

Many machines when not in use will depreciate at a rate little short of that which takes place when the machines are being used. Seven accountants included disuse as a cause of depreciation, while ten engineers listed this as a cause, showing that disuse is not considered as a very important factor in the depreciation of the ordinary machine.

Inadequacy according to Finney is: (2) "the result of business expansion which makes an asset which is still perfectly capable of carrying its old load unequal to the increased service required." Eight accountants, forty per cent of those replying, listed this as a cause of depreciation. Thirteen engineers, sixty-five per cent of the engineers replying, believed this was a cause of depreciation.

Accidents, as a cause of depreciation, had only four accountants and seven engineers to support it. In a great many shops the machinery is insured against accidents thus doing away with depreciation loss from that cause.

Many machines have their life materially shortened because of being handled by men who are incompetent or indifferent to the proper methods of handling them; this is known as misuse. Seven accountants and eight engineers listed this as a cause of depreciation, so it is evidently not considered as a very important cause.

Action of the elements was the eighth and last cause listed. Fourteen accountants or eighty per cent of the accountants listed this as a cause of depreciation. Ten engineers or just one-half of the engineers replying listed this as a cause of depreciation.

The engineers and accountants differed slightly in their choice as to causes of depreciation. The causes listed in order of the number of their supporters are as follows:

Accountants	Engineers
1 Wear and tear	1 Wear and tear
2 Climatic effects	2 Obsolescence
3 Action of the elements	3 Inadequacy
4 Obsolescence	4 Climatic effects
5 Inadequacy	5 Action of the elements
6 Disuse	6 Disuse
7 Misuse	7 Misuse
8 Accidents	8 Accidents

As was to be expected there was not altogether unanimity of opinion in the order of causes listed, but the difference of opinion expressed, considering the number of returns, is so slight as to be almost negligible.

Question 2. Which of the following values is preferable as a basis for determining the periodic charge to operations due to depreciation of machinery?

	Accountants	Engineers
1 Operating worth	0	2
2 Cost of replacement	0	9
3 Original cost	18	8

Eighteen accountants and nineteen engineers replied to this question. The accountants all believed in original cost as a basis, but the engineers were almost equally divided between original cost and replacement cost. This shows a distinct difference of opinion. The accountant during the whole of his school training deals only with original cost of machinery, to him it is the only tangible cost, all other costs being merely suppositions. Engineers in their appraisal work use present-day costs as a basis for figuring the present value of a machine, so that many of them are convinced that replacement cost is the correct basis for figuring the amount of depreciation.

Question 3. Should the annual depreciation on machinery be a

	Accountants	Engineers
1 A unit charge	15	8
2 A composite charge	2	10

There were seventeen accountants who answered this question and there was a decided majority in favor of the unit charge. In most industrial companies there is a special ledger for machinery, and all but the most minute items are entered separately; thus a careful check is kept on each piece of machinery, and it is only natural that the accountants should favor a unit charge. The engineer who is called in to appraise an industrial plant believes that he can reach an estimate on the value of its machinery just as accurately and more quickly if he combines in a composite group many machines of the same type.

Question 4. Which of the following is preferable as a basis of figuring depreciation on machinery;

	Accountants	Engineers
1 Straight line method	14	12
2 Constant percentage on a diminishing base	0	2
3 Production unit	3	1
4 Sinking fund	0	4

There were seventeen accountants who answered this

question, and there were only three who did not favor the straight line method. This is the method most commonly used, the reason being that so far as can be ascertained it is just as accurate as any other method in its results and it is the simplest method to apply. The engineers as a group were decidedly in favor of this method, but seven of the nineteen replying favored other methods. This indicates that there is a difference of opinion, and that there are engineers who do not believe the old established method is best.

Question 5. Should a machine in use one year which still operates at normal efficiency be considered to have depreciated?

	Accountants	Engineers
Yes	17	19
No	0	0

In their replies to the first question all the engineers included wear and tear as a cause of depreciation, and this goes on from day to day, so they were almost obligated to answer this question affirmatively. If, however, some of those replying had not included wear and tear as a cause of depreciation they might have considered that there was no depreciation of a machine until the actual moment when its efficiency dropped, and then answered the question negatively.

Question 6. Do machines depreciate faster in the:

	Accountants	Engineers
1 Early years	3	1
2 Later years	9	18
3 At a steady rate	3	0

There was some difference of opinion here, especially among the accountants, as this is a technical engineering question and one which has been experimented upon by engineers, the engineering viewpoint is perhaps more accurate. The engineers are almost unanimous in replying that machines depreciate more rapidly in the later years of their life. The accountants showed confusion of opinion, although the majority of them were agreed that the later years of the life of a machine are the years when depreciation takes place the faster. The accountants may have confused monetary depreciation with physical depreciation. It is common knowledge that monetary depreciation is very rapid during the early years of the life of a machine.

Question 7. Should the physical rate of depreciation be recognized in calculating the amount of annual depreciation?

	Accountants	Engineers
Yes	3	7
No	14	11

The accountants believed that actual and book depreciation should not be the same. This is consistent with the previous reply that the straight line method of depreciation is best. There was a slight majority of the engineers who believed that depreciation on the books is different from actual depreciation, the engineers are also consistent with their reply to question number 4, as there were seven engineers who believed that there were other methods more preferable than the straight line method of applying depreciation.

Question 8. Check those of the following which you consider good reasons for recognizing depreciation of machinery.

	Accountants	Engineers
1 To retain funds to replace original cost	9	11
2 To distribute the original cost over the useful life	15	8
3 To determine the true cost of production	17	15

The main difference of opinion between accountants and engineers on this question is in regard to the second reason. It is an accounting problem to apportion the cost of a machine over its probable future life so that when the machine has fully depreciated in value, it will have

been written off the books; this accounts for the added importance attached to this question by accountants. There were seventeen accountants who replied to this question and all of them included more than one of the reasons mentioned, showing that depreciation is recognized for several reasons. There were fifteen engineers who answered this question and they too thought depreciation should be recognized for several reasons.

Question 9. If figuring depreciation would you use any of the standard tables of depreciation?

	Accountants	Engineers
Yes	11	11
No	7	6

The replies made here were almost identical in both cases. Most of those who answered affirmatively qualified their answer in some way. Standard tables of depreciation were considered by both accountants and engineers as more of a guide than an absolute authority; modifications it was felt were absolutely necessary.

Question 10. If so (see # 9) would you add any extra charge for possible obsolescence?

	Accountants	Engineers
Yes	7	12
No	9	2

In question number one the engineers attached more

importance to obsolescence than the accountants did, and here again they did the same thing. Obsolescence is a factor which both accountants and engineers recognize, but the accountant is not in a position to see just how great a factor it really is. The engineer sees just how obsolescence is destroying the value of machines in his every day work.

Question 11. Do you believe the income tax law has been productive of a more equitable distribution of depreciation charges on machinery?

	Accountants	Engineers
Yes	15	8
No	3	3

There were eighteen accountants who answered this question and but eleven engineers. If the income tax law caused a more equitable distribution of depreciation charges the fact would be evidenced by a more regular and uniform charge to depreciation on the books of an industrial firm. Thus the accountants would be more likely to notice it than the engineers would. This is probably why there were more accountants who answered this question than engineers. As both accountants and engineers answered affirmatively it is safe to conclude that the income tax laws are favorably affecting the distribution charge of depreciation.

Question 12. Would you charge against the 'Reserve for Depreciation of Machinery' account all expenditures in the nature of complete renewals and replacements?

	Accountants	Engineers
Yes	11	11
No	6	5

This question is answered affirmatively by the majority of both accountants and engineers, and by almost the same count. There is, though, a large minority who disagree; so it is evident that the question is not one which can be answered dogmatically; and that there are some who believe that renewals and replacements are just repairs, and should be charged to that expense account.

Question 13. In estimating the future life of a machine would you take into consideration complete renewals and replacements?

	Accountants	Engineers
Yes	10	14
No	7	3

The life of a machine may be estimated as ten years with ordinary repairs being made, but often after six or seven years have elapsed the engineer in charge decides that by complete replacing part of the machine and by re-vamping the rest of the machine a saving may be made over the purchase price of a new machine. This would prolong

the life of the machine over the expected period and would call for a re-estimate. Accountants and engineers were both agreed that these re-estimates are often desirable and necessary.

Question 14. Should the repair policy be taken into consideration in determining the estimated life of a machine?

	Accountants	Engineers
Yes	13	14
No	5	3

The estimated life of a machine is often determined by reference to standard depreciation charts, or by past experience. The repair policy, many of those answering the question point out, is the modifying factor, for this reason the majority of both accountants and engineers believed it was a vital factor in determining the estimated life of a machine, and should be considered in determining its future life.

CHAPTER II

Comparison Of Accountants' And Engineers' Concepts Of Depreciation Of Machinery In Literature Read

The Romans were able engineers. Many of their works stand to-day, monuments of their engineering skill and

ability--the Coliseum, Hadrian's Wall, the military roads they built in Britain, France, Italy and elsewhere in Europe. Other products of their engineering skill were not so lasting and have long since vanished as the result of wear and tear, the action of the elements, and climatic effects. The Romans recognized this eventuality and their word *depretiare* (to lessen in value) expressed their idea of what took place. This word has been taken directly into the English language, and one of its many forms is the word depreciation.

Some of the Roman engineers in their writings referred to depreciation, and from them we can get useful information as to the early ideas regarding depreciation.

During the time of Augustus Caesar the engineer Vitruvius, who was in charge of the waterworks at Rome, in his book on engineering referred to depreciation as follows: (3) "No walls made of rubble and finished with delicate beauty, no such walls can escape ruin as time goes on. Hence when arbitrators are chosen to set a value on party walls, they do not value them at what they cost to build, but look up the written contract in each case, and then after deducting from the cost one-eightieth for each year that the wall has been standing decide that the remainder is the sum to be paid. They thus in effect pronounce that such walls cannot last more than eighty

years."

This Roman engineer recognized depreciation, used the straight line formula for figuring the amount of depreciation, and used cost as the basis from which to figure depreciation. These concepts of depreciation are still believed in at the present time.

Since the time of the old Roman Empire there have been many references to depreciation in historical works, such as The Doomsday Book, and there have been many technical treatises written on the subject of depreciation. But it was not until the modern industrial era was ushered in that the subject received much scientific investigation.

Depreciation according to the engineering board of the Interstate Commerce Commission is: (4) "the lessening in worth of physical property due to use or other causes." This definition is very broad and includes all of the reasons which might cause a piece of machinery to deteriorate in value such as wear and tear, climatic effects, obsolescence, disuse, inadequacy, accidents, misuse, action of the elements, and any other of several miscellaneous and infrequent causes.

Riggs, an engineering writer, in an article in The Railway Age says of depreciation that is is: (5) "the impairment of the investment in the physical plant." This definition is in accordance with the views of many other

engineering writers, in accordance with the views stated by the engineering board of the Interstate Commerce Commission, and seems to find general acceptance among engineers.

The committee on terminology of the American Institute of Accountants has stated as their definition of depreciation: (6) "the loss of value however caused." This definition is substantially the same as that of the Interstate Commerce Commission, there are no limiting causes, the definition is all inclusive, it covers any loss of value.

Kester, a recognized accounting authority, gives as his definition of depreciation: (7) "the decrease during a given period of the value of a fixed asset, due to wear and tear, lapse of time, obsolescence, etc." This definition states three of the more common causes of depreciation, but puts etc. at the end of the definition which might be construed to so broaden the definition as to bring it into accord with the other two quoted. Writers in current issues of accounting magazines, such as The Accounting Review, and The Journal of Accountancy, either state a definition like Kester's or quote the definition of depreciation given by the committee on terminology of the American Institute of Accountants.

There are some few writers, both engineers and

accountants, who would limit the causes of depreciation to the loss in value due only to such physical causes as wear and tear, action of the elements, and climatic effects. Finney thus specifically defines depreciation, treating decreased utility due to such functional causes as obsolescence, and inadequacy as separate elements.

The United States Supreme Court has handed down a decision recognizing the Treasury Departments definition of depreciation, as stated for income tax purposes, as being valid and legal. This definition of depreciation is: (8) "the gradual exhaustion of the usefulness of property employed in trade or business of a tax payer, such exhaustion comprising wear and tear, decay or decline from natural causes, and various forms of obsolescence such as are attributable to the normal progress of the art, inadequacy to the growing needs of the business and the necessity of replacement by new inventions."

The causes of depreciation are almost universally agreed upon, engineers, accountants, and law making authorities having the same ideas regarding a definition of depreciation.

Failure to Recognize Depreciation. The entrepreneur must pass on to the consumer this expense known as depreciation. It is as truly an expense of production as wages, rent, taxes, and all of the other commonly listed produc-

tion costs. Failure to recognize depreciation as a production cost when fixing the price at which one can profitably sell would be disastrous. Because unless profits were abnormally large or the element of depreciation were relatively insignificant, the insolvency of the business would probably follow.

Hatfield in his book on accounting says that: (9)
"all machinery is on an irresistible march to the junk heap, and its progress, while it may be delayed, cannot be prevented by repairs--consequently profits are not determined until after allowance has been made for depreciation."

Reasons for Recognizing Depreciation of Machinery.

For recognition of this expense of depreciation, funds are retained in the organization to replace the exhausted assets, calculated on original cost or on present replacement costs, according to the policy of the management. Each year the account, Reserve for Depreciation of Machinery, should be increased by the amount of estimated expense due to the depreciation of machinery. If this were not done the surplus apparently available for dividends would be proportionately larger, and if used for dividends would amount to a payment of dividends from the original investment in the machinery. This would result in an impairment of capital without compensation.

Thus, not because the Reserve for Depreciation is a

sinking fund built up by cash withdrawals from the business, which is an erroneous conception, but because by its creation the surplus available for dividends is more correctly stated and the funds are retained in the organization which accrue from the gradual realization of the value of the machinery through the inclusion of depreciation as a cost of production, and consequently as a part of the sales price.

A second reason for recognizing depreciation of machinery is in order to distribute the cost, either original or replacement, over the useful life of the machinery.

This reason finds more favor among accountants than among engineers. It is essentially an accounting problem to determine how the cost of the machinery, as it depreciates, may be recovered in the sale of the goods or services. By estimating the amount of expense each year, due to depreciation of machinery, and incorporating that expense in the factory expenses, you have passed this expense on to the customer as a part of the selling price of the goods or services, provided you sell at a profit.

A third reason for recognizing depreciation is in order to determine the true cost of production. This reason much resembles the second but has this point of difference that, whereas in the second reason you are concerned

only with collecting from the customer the cost of machinery, you are now concerned with charging in each fiscal period a proportionate amount of depreciation of machinery.

Summary. A definition of depreciation, with which I believe the majority of accounting and engineering writers would agree, is not hard to frame as there is little divergence of opinion among writers on the subject. Such a definition would be a broad all inclusive definition, much resembling that given by the engineering board of the Interstate Commerce Commission; (10) "the lessening in worth of physical property due to use or other causes".

The reasons for recognizing depreciation are divergent from the accounting point of view, the three reasons given: 1. To retain funds in the organization to replace the exhausted assets; 2. To distribute the cost over the useful life; 3. To determine the true cost of production, find many supporters, with many accountants listing all three reasons as of equal importance. Engineers are not much concerned with the last two reasons but many engineering writers have given the first named reason as the reason for recognizing depreciation.

Value to be Used. There is general agreement as to the causes of depreciation and the reasons for recognizing depreciation. But the subject, which of many values is

preferable as a basis for determining the periodic charge to operation, due to depreciation of machinery, finds many writers, both engineers and accountants, with differing opinions.

There are many values which have been and are being used, but original cost, cost of replacement, and operating worth are the values around which there is the most argument.

Original cost is acquisition cost to the present owner. For many years original cost was considered the only reputable base to use in figuring the depreciation charge, and the only conservative value to enter fixed assets on the books. It is the value which is strongly endorsed by Finney, Kester, McKinsey, and other well known writers on accounting subjects, as well as by such engineering writers as Wieman and Basset. Original cost is the basis which is favored by the income tax authorities.

The contentions of these writers regarding original cost is that while it is true that business management should give consideration to the problem of financing increased capital outlays, which result from rising prices, the adoption of a program of basing depreciation on replacement values will not solve this financial problem but would only result in a misstatement of operating expenses.

A proper charge for depreciation merely results in gradually charging operations with the cost of property which is being consumed by operations. The credit to the Depreciation Reserve, as has been stated before, is not a direct means of financing replacements but it is the means of indicating the estimated decrease in the value of an asset. The creation of the reserve prevents the impairment of capital by the payment of dividends in excess of profits. It does not, however, insure the existence of available cash for replacements.

Replacement cost is the cost of an asset of equivalent expected earning power without regard to technical aspects such as size, proportion, or type of material. Since the World War and its subsequent inflation and deflation of specie there have been many of the leading writers, both accountants and engineers, who advocate the use of replacement cost value as the basis for figuring depreciation. As an example of the extreme to which a rigid adherence to original cost would result these writers point to the inflated German mark subsequent to the World War. These writers believe that in an emergency such as this replacement cost is the only practical value to use; therefore, replacement cost is the logical basis of value at all times.

These writers contend that monetary values do change

and that they are of value. Their importance should be recognized, measured, and expressed because business is conducted in terms of present monetary values. Yet the orthodox accountant or engineer apparently wants business transactions of a given period expressed in terms of both past and present monetary values, and this results in the net worth at any time being expressed in such terms.

In order properly to express these changing replacement costs several solutions are offered. One solution is for the entire appreciation or depreciation in monetary values to be reflected not in the accounts nor in the body of the balance sheet but as a footnote to the balance sheet. Another suggestion is that index figures be used and changes in the accounts be made from year to year to bring them into line with the change in monetary values.

A third value to be used is operating worth, or going concern value. Machinery in use in a manufacturing concern which is regularly showing a profit from year to year is worth more than the same machinery lying idle in another plant. This value is known as operating worth.

Frequently when appraising the value of an establishment the engineer takes this fact into consideration and bases his value on it. It is a value a certain per cent above cost, either original or replacement, due to the profitableness of the business and bearing a direct rela-

tion to this profitability.

Reconstruction cost is a fourth value advocated by a few. It differs from replacement cost in that reconstruction cost is the cost of replacing a machine with an exactly similar machine regardless of the fact that the old machine may be obsolescent and that the cost of reconstructing it is almost prohibitory. An example of the results sometimes obtained by this method of valuation arose in Kansas City recently. In the shops of The Kansas City Railways there were three old locomotives which two engineers were asked to evaluate. One engineer went to the Westinghouse Company with exact specifications and found that to reconstruct the locomotives by special order they estimated the cost would be a million dollars. The other engineer appraised them as junk, and valued them at \$20,000. This method of valuation is not used extensively any longer except where reconstruction and replacement cost is identical.

These are the most commonly used bases of value. Original cost is the oldest basis of value, and is the basis in most common use. Many engineers and accountants favor it. Replacement cost is finding much approval among modern writers, but has not as yet proven its practical value. The third basis of value, operating worth, finds the most use among engineers doing appraising work of going

concerns. Few accountants use it as a value to put on the books. The fourth method, reconstruction cost, is not used extensively at present.

At the present time the most discussion of values is between original cost and replacement cost. It is certainly sound business to provide for the future in any line of endeavor, but the inclusion of future expenditures in present-day costs is questionable. One solution of this problem might be to set up a reserve to cover the difference between depreciation at cost and at replacement value. This reserve should be taken from surplus and not included in overhead charges. Such method would prevent dividends from being declared to such an extent that machinery could not be replaced when worn out, and yet present production costs would not be increased.

Actual Rate of Physical Depreciation. The problem of the actual rate of physical depreciation is a technical one and one which engineers are best qualified to investigate.

There have been many investigations carried on by engineers in regard to this, and graphs have been drawn showing the actual physical rate of depreciation of many machines. These graphs represent the actual rate of physical depreciation, and are not to be confused with depreciation from the liquidation standpoint.

To illustrate the difference between the service and liquidation concepts of depreciation the depreciation on a second hand car might be considered. If a new car were driven a few miles after being delivered to a business firm the depreciation would be considerable from the standpoint of its resale value, yet from a service standpoint with a depreciation rate of a few cents a mile its loss of value is negligible.

By far the larger number of machines depreciate, at an ever increasing speed as they grow older, when only physical depreciation is considered. Functional depreciation, depreciation from obsolescence and inadequacy, grows progressively with the age of the machine. So it can be readily seen that depreciation during the last years of the life of a machine is very heavy.

Methods of Applying the Depreciation Rate to Machinery.

The three methods in most common use are: the straight line method; the constant percentage on a diminishing base method; and the production unit method.

The straight line method is the simplest method both to figure out and to apply. It results in spreading the total depreciation equally over the life of the machine. The formula for computing the depreciation under this method is:

$$D = \frac{C - S}{n} \quad \text{when}$$

D = periodic depreciation
 C = cost of machine
 S = scrap value
 n = number of periods

This method is in most general use. It finds favorable acceptance from accountants and engineers for the purpose of spreading depreciation over the useful life of the machine but is considered inaccurate for figuring the amount of past depreciation on a machine for appraisal purposes. This method assures the return to the business through the rates charged an amount approximately equal to the expiration of plant values due to the production of the commodity sold.

The simplicity, ease of application, and apparent justness of this method have gained for it the favor of nearly all concerned with a practical method of figuring depreciation.

The second method is designated as the constant percentage on a diminishing base. The percentage of depreciation charged off remains constant, but the base is reduced each year by the amount of depreciation charged off the previous year. This results in a smaller amount of depreciation being charged off during each succeeding year of the life of a machine. This method more closely follows the curve of depreciation from the liquidation

standpoint. The results from the application of this formula are more nearly accurate for short periods of time than for long periods. The formula for computing depreciation by this method is:

$$D = \sqrt[n]{\frac{S}{C}}$$

when

D - periodic depreciation

C - cost of machine

S - scrap value

n - number of periods

Since repairs and renewals cost least during the first years of the life of a machine and increase with more advanced years of the life on a machine they offset, to a certain extent, this continually decreasing depreciation charge and tend to make the total cost of upkeep and depreciation uniform.

The third method is the production unit method of charging off depreciation. This method distributes the depreciation over the number of estimated units of product the machine will produce, and the rate of depreciation is a rate per unit of product. The formula for computing depreciation by this method is:

$$D = \frac{C - S}{u}$$

when

D - periodic depreciation

C - cost of machine

S - scrap value

u - number of units produced

Where a factory is large enough to keep cost records this method finds considerable support among both engineers and accountants and is, in many instances, the method used. It has in its favor, under the above conditions, many of the same reasons for its use as the straight line method has.

In the case of public utilities operating electric cars or buses this method is sometimes used in a modified form. A depreciation rate of four cents per mile has been estimated as correct for large buses, and this includes the obsolescent factor in depreciation.

In calculating the amount of annual depreciation the actual depreciation is not very much of a consideration to an accountant. He generally charges a flat rate by the straight line method and thus levels off the actual heavy rate of depreciation in the later years against the light rate in the early years. Accountants and engineers are generally agreed that for the accounting purpose of recovering the cost of a machine through the inclusion of depreciation as an expense item the straight line method of figuring depreciation is the best.

However, for the engineering purpose of estimating

the amount of depreciation the straight line method has little place. The method of appraisal by experts taking into consideration all local conditions is the best method, and this method of appraisal has the sanction of the courts. The engineer is not interested in distributing the depreciation charge over the useful life of a machine in an even manner. He wants to know the actual physical depreciation which has taken place since the machine was installed.

All the machinery may be lumped together in an account called machinery and a single charge to depreciation expense made yearly on the total figure. Or there may be a control account in the general ledger, with a separate ledger for machinery, and with the depreciation expense figured on each item. The first method is known as the composite charge to depreciation; the second method is called the unit charge to depreciation.

Most of the engineers answering the questionnaire favored the composite charge, but engineers writing on the subject are advocating the unit charge more and more strongly.

The composite charge has little in its favor excepting that it is the simplest method to apply. In a few cases where there are many machines of identical make used for exactly the same purposes--as for instance in a machine

shop where there are many lathes and many small electric motors--this method works with a fair degree of accuracy. Generally speaking, though, it is not accurate enough.

Practically all the accountants answering the questionnaire or writing on the subject favor the unit charge. A unit charge gives greater accuracy for cost accounting purposes such as are carried on in all large shops. It causes a little more work, but in most cases the added knowledge more than compensates for this.

The Bureau of Internal Revenue considers depreciation by items, but it has no objection to the use of composite rates when such rates are determined as accurately as possible from the anticipated useful lives of the items comprising the aggregate property. No losses are allowable upon disposal of items of property because it is assumed that overestimates and under estimates of useful lives will balance when the composite rate is employed.

A clear definition of what constitutes an item is necessary in order to apply the unit rate successfully. For example, if a boiler is considered an item the useful life is twenty to twenty-five years. But if the item is the boiler shell or tubes the life is much shorter. This must be considered and these items not charged against the reserve when replaced complete.

Standard Tables of Depreciation. A standard table

of depreciation for machinery is a table drawn up by an expert or group of experts purporting to show the rate of depreciation for a particular machine in any line of industry, or for machinery in a particular industry. Such tables have been drawn up for use in many industries such as public utilities, lumber milling, flour milling, or any of the other various types of industry.

Such tables have been made for particular types of machines such as reciprocating steam engines, turbine engines, and gas engines. These tables generally give a range and an average. For example, gas engines range from five to ten per cent and average from twelve sources seven per cent. In most of these standard tables there is a rate given with a variation allowance of two or three per cent either way. The tables drawn up by the Bureau of Internal Revenue allow a variation of one-fifth of the per cent given either way.

There are two types of standard depreciation tables, those which include obsolescence in the rate set, and those which do not. Obsolescence is of two types: (1) a sudden loss caused by a revolutionary change; (2) a gradual reduction of usefulness due to the cumulative effect of small improvements. Some tables consider this latter type of obsolescence in setting the rates.

It is the concensus of those writing on the subject

that standard rates of depreciation to be rigidly adhered to are a long way in the future. Both accountants and engineers believe that standard depreciation tables are useful--but only as a guide to be modified in each separate case.

The Bureau of Internal Revenue called upon certain industries to furnish data concerning standard depreciation rates on the various types of machinery. This data was to be compiled and after conclusions were reached the rates for the industries were to be published in a treasury bulletin. These rates were not to be mandatory but were to be taken as a basis. Any reasonable variation would be allowed, or if there was a wide variation due to special causes this too would be allowed.

The American Institute of Accountants through their executive committee protested against this action. They felt that the establishment of uniform depreciation rates in any or all industries would be unwise and impractical. The committee felt that it would not be possible to draft a schedule of uniform rates, even if it were attempted to provide the widest elasticity which could be applied in all cases within any particular industry. They stated that the whole question of depreciation rates is beset with difficulties owing to the intimate connection with maintenance. It was felt that any schedule advanced, while purely

advisory in the beginning, would be in danger of becoming mandatory.

On behalf of the Cotton-Textile industry a brief was presented to the Bureau of Internal Revenue, U.S. Treasury Department. This brief took exception to the standard rates of depreciation which had been published as applicable to the cotton textile industry on the following points:

- (11) "1. It is wholly impracticable to apply standard rates to the cotton textile industry and any attempt to do so would produce highly inequitable results.
2. Even if it were practicable the rates proposed are wholly inadequate.
3. Obsolescence is a factor of continually increasing importance in the industry, and the failure to make any such allowance constitutes a fatal defect in the bureau's tentative bulletin."

These two protests from the engineering and accounting fields present the feeling regarding the use of standardized depreciation tables which writers on this subject have almost universally taken. No single plant is comparable with any other. An industry which could compute fair averages would render a distinct service, but it is generally regarded as impossible.

CHAPTER III

Summary On Conclusions Of Engineers' And Accountants' Concepts Of Depreciation

1. Engineers and accountants, both students and practitioners, are agreed on most of the major problems of depreciation. They are all agreed that there are many causes of depreciation, and that wear and tear, obsolescence, and inadequacy are the major ones. All follow the straight line method of figuring depreciation. They are unanimous in declaring that with use a machine depreciates even if the efficiency is not impaired, and that during the later years of a machine's life depreciation takes the greatest toll. They both believe in the various reasons listed in the questionnaire for recognizing depreciation, and in almost the same order. Practitioners in both fields believe in using standard depreciation tables, at least as guides, but writers in both fields condemn them.

2. Accountants firmly believe in original cost as a basis for figuring depreciation, but engineers are divided in their choice between the use of original cost and replacement cost. Engineers are divided in their opinion as to whether the annual depreciation charge should be a unit charge or a composite charge, but accountants are convinced

that it should be a unit charge.

3. There are phases of depreciation in the opinion of the author where the technical training of one group or the other gives them special authority to answer. The engineer deals with physical conditions, studies plant deterioration, and necessity of replacement. The accountant has the problem of devising ways and means of recording in the most intelligible manner the facts in connection with these changes. The engineer shows what the rate of depreciation is, the accountant suggests devices for recording it and for providing replacement funds.

The problem of appraising a piece of property is peculiarly that of the engineer. The Supreme Court has ruled; (12) "The testimony of competent valuation engineers who examined the property and made estimates in regard to its condition is to be preferred to mere calculations based on averages and assumed probabilities."

The accountant has been chosen by the income tax authorities as the person best suited; (13) "to apply the rates of depreciation in conformity with sound accounting principles."

CHAPTER IV

Results From Questionnaire On Engineers' And
Accountants' Concepts Of Appreciation Of Machinery

Results from Questionnaire. The results from the questionnaire regarding appreciation are shown below. Page two of the questionnaire contained six questions which covered the most important problems regarding appreciation.

Question 1. Do you consider the following an adequate definition of appreciation? Appreciation is an accretion to the value of an asset not attributable to an expenditure, but rather to a present or prospective increase in its financial productiveness.

	Accountants	Engineers
Yes	17	14
No	3	6

It was important to get a definition of appreciation broad enough to cover the entire subject. This definition was chosen from one given in the Journal of Accountancy, and was but slightly modified.

The majority of both accountants and engineers favor this definition as being adequate. Eighty-five per cent of the accountants answered the question affirmatively and seventy per cent of the engineers, so it is evident that

the definition is satisfactory to most of those replying.

Question 2. Check those of the following which you consider give rise to the appreciation of machinery.

Accountants Engineers

1. Intelligent application of labor and capital	4	3
2. Able management	2	6
3. Social progress	5	5
4. Industrial progress	6	6
5. Change in prices	20	16
6. Discovery	6	7

This list includes only the factors of major importance in the appearance of appreciation of machinery. Yet on only one of the causes listed was there anything approaching unanimity of opinion--the accountants all agreeing that a change in prices gives rise to appreciation, and sixteen out of the twenty engineers also including this cause. Of the five other factors listed four of them--able management, social progress, industrial progress, and discovery--received almost the same number of votes by the engineers. Of these same five factors the accountants replying favored three of them--social progress, industrial progress, and discovery--by almost the identical vote as the engineers. Change in prices is the cause that most of those replying favored. Each of the other causes had

some supporters, but there was such a confusion of opinion within the groups that no clear cut opinion can be stated as to just what factors they favored as giving rise to appreciation other than change in price level.

Question 3. Should depreciation be charged on appreciation of machinery?

	Accountants	Engineers
Yes	12	6
No	8	12

The engineers were definitely against any depreciation being charged on appreciation, while the accountants believed such a charge should be made. Most accountants do not favor the recognition of appreciation at all, but if it is recognized and appears on the books they believe it should be treated as if it were part of the original cost and be subject to depreciation charges. On the other hand the engineers believe that the depreciation charge should be made only on the original cost.

Question 4. Should appreciation of machinery not realized be available for cash dividends?

	Accountants	Engineers
Yes	0	2
No	20	18

Should appreciation of machinery not realized be available for stock dividends?

	Accountants	Engineers
Yes	3	2
No	16	13

Engineers and accountants were both agreed on these two questions, and the opinion as shown by those answering yes and those answering no was very decided. Appreciation of machinery not realized is not available for either cash or stock dividends. This is in accordance with good accounting principles and it is economically sound.

Question 5. Should appreciation of machinery be brought into the accounts before it is realized?

	Accountants	Engineers
Yes	7	2
No	12	16

The majority opinion in both groups was against bringing appreciation of machinery into the accounts before it is realized. But there were seven accountants who answered this question by saying that appreciation should be brought into the accounts before it is realized. This shows a radical departure from accounting teachings in the past, and is interesting evidence of the trend of thought which is just coming in. Many writers in accounting magazines are advocating this same idea.

Question 6. Is appreciation of machinery income?

	Accountants	Engineers
Yes	1	5
No	19	15

The majority of those replying believed appreciation of machinery was not income. This is in line with their opinion that appreciation of machinery is not available for dividend purposes. The engineers did not appear as emphatic in their opinion as did the accountants.

CHAPTER V

Comparison Of Accountants' And Engineers' Concepts Of Appreciation Of Machinery In Literature Read

The first thing to be determined is whether the word appreciation means the same to all, or whether it conveys a different meaning to some than to others. If a definition of appreciation is the same in the minds of all accountants and engineers then there is a common ground to start from. If there is no prevailing idea as to what appreciation is there must be confusion about the whole subject.

The special committee on terminology of the American Institute of Accountants has defined appreciation as; (14) 'an increased conversion value of property or mediums of exchange due to economic or related causes, which may prove

necessity a machine should be more valuable by the amount of money spent on it. Otherwise it would not be economically sound to spend money on it. The words 'present or prospective financial productiveness' are used to show the measure of value in appreciation.

If the definition were quoted exactly it would read 'relative financial productiveness'. The word 'relative' is purposely omitted because wide reading on the subject, and a survey of replies to the questionnaire, show that almost without exception engineers and accountants believe that dollar appreciation is the main factor in the rise in value of a machine.

Definitions are necessarily subject to inherent weaknesses. They seldom are broad enough to cover all issues, and it is seldom possible to construct an intelligible sentence which embraces the whole of an idea or concept. I believe the best way to get an understanding of appreciation is to study causes and effects.

The effects of appreciation are well known; they give rise to many arguments in court in favor of rate increases for utility companies; they lead business men to wonder if they can derive any benefits from them; they cause the auditor many problems in connection with the presentation of correct financial condition by means of the balance sheet.

Causes of Appreciation. Intelligent application of

labor and capital may be one cause. The reclamation of a swamp or the irrigation of arid land is an example of this. The land becomes more valuable and so as a result the farmer's machinery becomes more valuable to him, and it does more work at the same initial cost. This is only true when the machinery is so situated that the cost of moving it is prohibitive, as for instance heavy mine machinery.

Able management brings about increased financial productiveness from each machine and thus a cause of appreciation. Managerial foresight, for example, might cause the maximum possible output from each machine, thus decreasing the unit cost of the product.

Social progress sometimes results in an appreciation of machinery. The principal factors under social progress are an increase in population and a higher standard of living. Both of these factors might conceivably cause the increased use of some product, thereby increasing indirectly the value of machinery.

Industrial progress is a cause of both appreciation and of obsolescence. Invention makes deeper drilling possible, thus increasing the productiveness of mining properties. Science devised the cracking process for increasing the proportion of gasoline extracted from petroleum and as a result oil refining plants became more

valuable. In the same way discovery might increase the value of machinery in an oil refining plant.

The most important single factor in increasing the value of machinery in a plant is an upward rise in the price level. This is the opinion of the large majority of writers, both engineers and accountants. The fact that the dollar has depreciated the amount that the machine has increased in value is disregarded. An upward change in price levels brings about appreciation of machinery.

Both engineering and accounting writers have included some or all of these causes of appreciation in their magazine articles and in their books on appreciation of machinery. There is practically no difference of opinion between engineers and accountants in regard to the causes of appreciation. Some include certain of the causes mentioned, some others; but seldom are any of the causes mentioned specifically excluded as not being causes of appreciation.

Appreciation of Machinery in the Accounts. This is a controversial point concerning which much has been written lately by accountants. If the appreciation has been realized upon it becomes necessary to show it in the accounts.

If an appraisal shows that a company's machinery has increased in value, or if there has been an offer to buy the machinery at an increase over its cost price, then

to be temporary or permanent." One well known accounting writer defines appreciation as, (15) "the increase of value which may be attributed to advancing costs of replacements." Another definition is, (16) "appreciation is the increase in value through improvement in condition or market value." In engineering magazines appreciation has been defined as, a rise in value, and as, an enhancement in value. Thus the idea of an increase in market value, due to whatever cause might so effect machinery, is the fundamental idea in the minds of all. As no specific causes were mentioned it can be assumed that any cause giving rise to increased market value is appreciation.

A definition of appreciation which covers all phases of the subject, and which seems to be broad enough to embody the ideas on appreciation prevalent among engineering and accounting writers, is that given in the questionnaire-- (17) "Appreciation is an accretion to the value of an asset not attributable to an expenditure, but rather to a present or prospective increase in its financial productiveness." This definition is one carefully worked out by the graduate students of the University of Illinois.

The word 'accretion' is used in this definition because it suggests that appreciation grows as time goes on and does not come into existence at one moment of time.

'Not attributable to an expenditure' is used because of

there has been appreciation of machinery. Should this appreciation, unrealized, be entered on the books?

There is little question of the ability of the modern accountant or the modern accounting system to bring appreciation into the accounts. Double entry book-keeping is so comprehensive that there is little trouble in making anything required a matter of record. Since unrealized appreciation is never the result of an expenditure it would never enter the accounts as a matter of course. Consequently if it were brought into the accounts at all it would be by entries such as:

Dr. Appreciation to the Value of Machinery xx.xx

Cr. Reserve for Appreciation of Machinery xx.xx

Appreciation to the Value of Machinery is an adjunct account to the machinery account reflecting the original cost. This account is debited with the estimated increase to the value of machinery. Reserve for Appreciation of Machinery is a labeled portion of Surplus representing and arising from the estimated increase in the value of machinery, this account is credited with the same amount as is debited to Appreciation to the Value of Machinery. On the asset side of the balance sheet it would appear as an account labeled Appreciation to the Value of Machinery. In the equities it would appear as a reserve account show-

ing an identical increase in net worth.

Accountants differ as to the advisability of bringing unrealized appreciation into the accounts.

On the one hand is the viewpoint of those who maintain that the value an asset has on the books should be its present day or replacement value. These writers believe that unrealized appreciation should be entered into the accounts in order that the accounts may be kept modern, up to date, and accurate. These writers believe that by so doing the costs are correctly figured and the balance sheet represents the company's accounts exactly as they are at the present time. They do not believe in 'conservatism' or in a 'theoretical cost price'. They point out that appreciation is no more of an estimate than depreciation is, and if it is correct to include the one it is correct to include the other. One writer goes so far as to say that an accountant should be censured as severely or even legally punished for being found guilty of over conservatism as for being found guilty of over optimism or carelessness..

Many accountants believe that cost prices only should be entered into the accounts. These accountants state that cost prices are the only static prices and the only prices that have actuality. All other prices are mere guesses. Present day prices or replacement cost, they contend,

change from day to day and have no true significance.

The market price of goods these accountants believe is independent of any firms cost prices, so that a firm will get the same price for the goods it produces regardless of the value set up on its books, or of the depreciation expense charged on these values. A good accountant should keep the management advised at all times of the probable replacement value of the machinery, so that when the machinery has fully depreciated a reserve may have been set up equal to the cost of replacement.

In order that present day prices may be available for insurance or banking purposes a supplemental balance sheet called statement of affairs would be drawn up, or footnotes to the regular balance sheet would be made.

These are the two viewpoints taken by accounting writers. The idea of showing appreciation in the values shown marks a radical departure from past accounting procedure. This idea is being advanced by some accounting writers but it is taking hold very slowly.

Most engineers believe that if an appraisal has established the fact that machinery has appreciated in value then the correct figures for the balance sheet are these appreciated figures. But not much has been written on this problem by engineers, as it really is an accounting one and does not involve the engineers.

The income tax authorities do not consider appreciation in their calculations, but this of course does not prohibit its appearance on a firms books.

Is Appreciation a Depreciating Element? If appreciation of machinery has been entered into the accounts for one of several reasons such as because it is being realized upon; or because, as in the case of public utilities, for rate making purposes; or again simply because the accountant or the management believe in recognizing appreciation--then, should this appreciation be treated as a depreciating element?

The majority of engineers answering this question replied no. There has been little written on this question by engineers, so I have been unable to substantiate this opinion.

Accountants are divided in their opinions. Some of the more conservative writers say no. Market values, they believe, should not enter into the computation of depreciation, as it is the equivalent to charging production with probable future replacement costs, and yet it does not insure the existence of available cash for replacements.

Many writers in accounting magazines of recent date are urging that depreciation charges be made on appreciation. One writer says that the test of appreciation is; (18) "the fact that earnings will justify depreciation on

appreciation." They believe the recognition of depreciation on appreciation will retain funds in the enterprise which may be used to replace a physical unit of like productiveness.

Appreciation and Dividends. Although business is facing a period of falling prices and costs, the question of whether or not surplus arising from unrealized appreciation of assets is available for dividends is still important.

The business man, the accountant, and the engineer have looked to the law for help in answering this question. The law because it is utterly lacking in uniformity as to its treatment of this problem has been unable to take a definite stand.

There are six states which have passed statutes specifically mentioning dividends from unrealized appreciation of assets. Ohio and Idaho statutes make such a dividend illegal while Wisconsin statutes make it legal. In New York and Vermont a dividend from unrealized appreciation of dividends is legal by implication. The Alabama statutes permit stock dividends from an increase in the value of assets but did not permit cash dividends.

The remainder of the states can be divided into the balance sheet group and the profit and loss statement group.

In the balance sheet group are nineteen states,

Arkansas, Colorado, Florida, Illinois, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Mississippi, Nebraska, New Hampshire, Tennessee, Texas, Wyoming, and Virginia, whose statutes forbid dividend payments if the corporation is insolvent or will be rendered insolvent or if the capital stock is impaired. But in these states there has been difficulty in interpreting the statutes in the courts, because the statutes are not specific as to whether present value or cost value of the assets is to be taken, and there have been conflicting opinions given.

In the case of *Coleman v. Booth* (1916) 268 Mo. 64. the company wrote up the value of its goodwill in order to show a surplus out of which a dividend might be declared, and justified the reappraisal on the high earning power. The court condemned this procedure and held the directors liable for the dividends declared.

In the case of *Spillgerber Brothers v. Skinner Packing Co.* (1930) 228 Tex. 531, the defendant corporation having learned that real estate which cost \$98,661 was valued at \$372,779 by an appraisal company added the increase to the asset account and credited it to surplus, they then declared dividends from this surplus. The court upheld this procedure.

The third group of states is the profit and loss

group. In this group the only legitimate source of dividends is surplus profits. Consequently these states do not permit the declaration of dividends from appreciation unless the appreciation comes within the classification of surplus profits. The states in this group are Arizona, California, Georgia, Indiana, Louisiana, Maine, Montana, New Mexico, North Carolina, Oklahoma, North Dakota, Pennsylvania, Rhode Island, South Carolina, South Dakota, Utah, Washington, West Virginia.

There is confusion of court decisions in this group of states, as in the balance sheet group. In the case, *Privat v. Grand Bay Land Company*, (1919) 41 S.D. the company claimed the right to declare dividends when its assets included some of its land at what they considered a fair market price. The court of South Dakota upheld this.

In the case of *Southern California Home Builders v. Young* (1920) 188 Cal. the directors paid three dividends on the basis of statements prepared by bookkeepers of the company, appraisals of corporation property and the certificate of a Certified Public Accountant. The courts decision ruled: (19) "mere advance in value of property prior to its sale, or estimated profits on partially executed contracts do not constitute profits, because the fluctuations of the market may bring about a condition such as was found in the present case where estimated profits

were in fact liabilities or direct losses."

To summarize, the courts are agreed that realized appreciation of corporate assets is available for dividend purposes, but in many states there are conflicting opinions regarding the distribution of cash dividends because of unrealized appreciation. Stock dividends from unrealized appreciation are expressly legalized in six states and are legalized by implication in the other states. No American decision permits a corporation to offset depreciation by appreciation.

The idea of allowing cash dividends to be declared from unrealized appreciation is contrary to all good accounting procedure, such writers as Kester, Briggs and Montgomery expressly condemn it as conducive to poor business practice.

The trend of the law appears to be toward the accountants viewpoint on this subject. In this regard the Uniform Business Corporation Act was a great step toward more universal agreement. It states: (20) "No corporation shall pay dividends in (a) cash or property except from the surplus of the aggregate of its assets over the aggregate of its liabilities including in the latter the amount of its capital stock after deducting from such aggregate of its assets the amount by which such aggregate was increased by unrealized appreciation in value or revaluation of fixed

assets; (b) in shares of the corporation except from the surplus of the aggregate of its assets over the aggregate of its liabilities, including in the latter the amount of its capital stock."

In the last three years six states have adopted statutes making illegal a payment of dividends out of surplus arising from unrealized appreciation of assets. Other states are considering proposed corporation acts in which the question is covered definitely and clearly.

It is safe to say then that the trend of the law is toward making cash dividend payments from unrealized appreciation illegal by statutory enactment, and it seems that the law and accounting authorities are approaching agreement on the subject. Engineers have written little on this subject, but seem to regard the question as one not in their province.

The question of whether or not to declare stock dividends from unrealized appreciation has not been handled with the same thoroughness. There is a tendency to declare such an issue of dividends legal. But the importance attached to the case is minimized, since a stock dividend would merely thin out the stockholders equity, and if the stockholders do not object to this it may be good policy on the part of the management to split the stock up to such an extent that the cost of individual

shares is not prohibitive to the ordinary investor.

CHAPTER VI

Summary Of Conclusions On Engineers' And Accountants' Concepts Of Appreciation

The summary of results reached from this study of the comparison of the accountants' and engineers' concepts of appreciation are:

(1) Engineers and accountants are in agreement on many of the causes of appreciation, such as (a) that the causes of appreciation are change in prices, discovery, industrial progress, and social progress, (b) the fact that appreciation not realized is unavailable for cash dividends, and that it is doubtful if it should be used for stock dividends, (c) that appreciation of machinery is not income, (d) a definition of appreciation stating, that it is an accretion to the value of an asset, not attributable to an expenditure but rather to a present or prospective increase in its financial productiveness, is agreed upon by accountants and engineers.

(2) Accountants in practice believe depreciation should be charged on appreciation of machinery and accounting writers took the same stand. Engineering writers and engineers in practice do not think that any depreciation

should be charged on appreciation of machinery. This was the only point where engineers and accountants failed to agree.

(3) There was considerable difference of opinion within the groups on some of the problems of appreciation. Engineers and accountants both expressed a wide difference of opinion as to the causes of depreciation. There was also much difference of opinion as to whether depreciation should be charged on appreciation of machinery.

The results of this investigation on appreciation prove that, broadly speaking, accountants and engineers have much the same ideas regarding appreciation.

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LITERATURE CITED

- (1) Kester, R. B.
Accounting theory and practice. Edition 3.
New York. The Ronald Press Company, 2: 547.
1930.
- (2) Finney, H. A.
Principles of accounting. New York.
Prentice-Hall, Inc., 2: 2, ch. 39. 1924.
- (3) Hale, H. E.
What is depreciation. Railway Age, 86: 403.
1929.
- (4) Wendt, Edwin F.
Depreciation as a factor in railway
valuation. Railway Age, 86: 187. 1929.
- (5) Hale, H. E.
What is depreciation. Railway Age, 86: 406.
1929.
- (6) Londholtz, T. D.
Accounting for depreciation. Pathfinders
Service Bulletin, 38: 16. 1932.
- (7) Hester, R. B.
Accounting theory and practice. Edition 3.
New York. The Ronald Press Company, 2:
49. 1930.
- (8) Londholtz, T. D.
Accounting for depreciation. Pathfinders
Service Bulletin, 38: 18. 1932.
- (9) Hatfield, H. R.
Accounting its principles and problems.
New York. D. Appleton and Company, 130-131.
1927.
- (10) Wendt, Edwin F.
Depreciation as a factor in railway
valuation. Railway Age, 86: 187. 1929.

LITERATURE CITED
Cont'd.

- (11) Rearick, A. C. and Simpson, S. P.
Standardized depreciation rates for cotton
textile industry held impracticable.
Textile World, 78: 1222. 1930.
- (12) Hale, H. E.
What is depreciation. Railway Age, 86:
404. 1929.
- (13) Grimes, J. A.
The income tax--depletion and depreciation.
The Accounting Review, 3: 162. 1928.
- (14) Symposium on appreciation. The Accounting
Review, 5: 2. 1930.
- (15) Paton, W. A.
Accounting. New York. The Macmillan Co.,
2: 625. 1924.
- (16) Sherwood, J. F.
Public accounting and auditing. Cincinnati.
South-Western Publishing Co., 1: 244. 1920.
- (17) Symposium on appreciation. The Accounting
Review, 5: 3. 1930.
- (18) Symposium on appreciation. The Accounting
Review, 5: 55. 1930.
- (19) Briggs, L. L.
Appreciation and dividends. The Accounting
Review, 7: 32. 1932.
- (20) Lundahl, M. O.
Appreciation and the statutes. The
Accounting Review, 7: 190. 1932.

BIBLIOGRAPHY

- Adams, J. P.
Depreciation accounting and public utility valuation.
The Accounting Review, 5: 99-105. 1930.
- Bauer, John.
Depreciation and public utility valuation.
The Accounting Review, 5: 106-110. 1930.
- Bennett, G. E.
Treatment of appreciation. The Journal of
Accounting, 45: 427-440. 1928.
- Bonbright, J. C.
The concept of depreciation as an accounting
category. The Accounting Review, 5: 117-124. 1930.
- Briggs, L. L.
Appreciation and dividends. The Accounting Review,
7: 29-37. 1932.
- Cross, W. G.
Public Utility depreciation. Electric World,
90: 841-843. 1927.
- Cross, W. G.
Determination of depreciation. Electric World,
90: 995-997. 1927.
- DuBral, E. F.
The depreciation account. American Machinist,
70: 619-622. 1929.
- Finney, H. A.
Principles of accounting. New York. Prentice-
Hall, Inc., 1: ch. 21. 1924.
- Finney, H. A.
Principles of accounting. New York. Prentice-
Hall, Inc., 2: ch. 39-40. 1924.
- Grimes, J. A.
The income tax--depletion and depreciation.
The Accounting Review, 3: 161-176. 1928.

BIBLIOGRAPHY
Cont'd.

- Hale, H. E.
What is depreciation. The Railway Age, 86:
403-406. 1929.
- Hatfield, H. R.
Accounting its principles and problems.
New York. D. Appleton and Co., pp. 130-167. 1927.
- Hester, R. B.
Accounting theory and practice. Edition 3. New
York. The Ronald Press Co., 2: 420-447. 1930.
- Krebs, W. S.
Asset appreciation. The Accounting Review, 5:
60-74. 1930.
- Lundahl, M. O.
Appreciation and the statutes. The Accounting
Review, 7: 199-193. 1932.
- Mason, Perry.
The treatment of depreciation in the interstate
commerce commission valuation cases. The
Accounting Review, 3: 141-148. 1928.
- Mason, Perry.
Accounting for current depreciation. The
Accounting Review, 5: 106-110, 1930.
- Mather, C. E.
Depreciation and appreciation of fixed assets.
The Journal of Accountancy, 45: 185-190. 1928.
- McKinsey, J. O.
Managerial accounting. Chicago. University of
Chicago Press, pp. 583-607. 1924.
- Moser, A. W.
Depreciation based on unit cost. The Journal
of Accountancy, 52: 25-39, 110-125. 1931.

BIBLIOGRAPHY Cont'd.

- Hash, L. R.
Depreciation accounting methods for public utilities. The Accounting Review, 5: 125-141. 1930.
- Newlove, G. H.
Depreciation. The Journal of Accountancy, 44: 432-437. 1927.
- Paton, W. A.
Accounting. New York. The Macmillan Co., 2: 424-443. 1924.
- Rorem, C. R.
Replacement cost in accounting valuation. The Accounting Review, 4: 167-174, 1929.
- Saliers, E. A.
Principles of depreciation. New York. The Ronald Press Co. 1918.
- Scott, D. R.
Valuation for depreciation and the financing of replacements. The Accounting Review, 4: 221-226. 1929.
- Sherwood, J. F.
Public accounting and auditing. Cincinnati. South-Western Publishing Co., 1: 209-245. 1920.
- Symposium on appreciation. The Accounting Review, 5: 1-59. 1930.
- Wendt, E. F.
Depreciation as a factor in railway valuation. The Railway Age, 86: 187-191. 1929.
- Wieman, E. F.
Depreciation at cost or replacement value. American Machinist, 69: 383. 1928.

APPENDIX A

KANSAS STATE AGRICULTURAL COLLEGE
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 Department of Economics & Sociology

This questionnaire is being presented to selected groups of practicing accountants and consulting engineers in order to secure their opinions, which will be summarized in a Master's Thesis on the subject "A comparison of the accountants' and engineers' concepts of depreciation and appreciation". Replies as well as any additional comments you may care to make will be greatly appreciated.

DEPRECIATION

1. Check those of the following which you consider depreciation of machinery to include:

- | | |
|-----------------------|-----|
| 1. Wear and tear | () |
| 2. Climatic effects | () |
| 3. Obsolescence | () |
| 4. Disuse | () |
| 5. Inadequacy | () |
| 6. Accidents | () |
| 7. Misuse | () |
| 8. Action of elements | () |

2. Which of the following values is preferable as a basis

for determining the periodic charge to operation, due to depreciation of machinery?

1. Operative worth ()
2. Cost of replacement ()
3. Original cost ()

3. Should the annual depreciation on machinery be:

1. A unit charge, or ()
2. A composite charge? ()

4. Which of the following is preferable as a basis of figuring depreciation on machinery:

1. Straight line method ()
2. Constant percentage on a diminishing base ()
3. Production unit ()

5. Should a machine in use one year which still operates at normal efficiency be considered to have depreciated?

_____.

6. Do machines depreciate faster:

1. In the early years of their life? or ()
2. In the later years? ()

7. Should this (See #6) be recognized in calculating the amount of annual depreciation? _____.

8. Check those of the following which you consider good reasons for recognizing depreciation on machinery.

1. To retain funds to replace the original cost

2. To distribute the original cost over the useful life
3. To determine the true cost of production
9. If figuring depreciation on machinery would you use any of the standard tables for depreciation? _____.
10. If so (See #9) would you add any extra charge for possible obsolescence? _____.
11. Do you believe the income tax law has been productive of a more equitable distribution of depreciation charges on machinery? _____.
12. Would you charge against the "Reserve for Depreciation of Machinery" account all expenditures in the nature of complete renewals and replacements? _____.
13. In estimating the future life of a machine would you take into consideration complete renewals and replacements? _____.
14. Should the repair policy be taken into consideration in determining the estimated life of a machine? _____.

APPRECIATION

1. Do you consider the following an adequate definition of appreciation? Appreciation is an accretion to the value of an asset, not attributable to an expenditure but rather to a present or prospective increase in its financial productiveness? _____.
2. Check those of the following which you consider give

rise to appreciation of machinery.

1. Intelligent application of labor and capital ()
 2. Able management ()
 3. Social progress ()
 4. Industrial progress ()
 5. Change in prices ()
 6. Discovery ()
3. Should depreciation be charged on appreciation of machinery? _____.
4. Should appreciation of machinery not realized be available for cash dividends? _____. For stock dividends? _____.
5. Should appreciation of machinery be brought in to the accounts before it is realized? _____.
6. Is appreciation of machinery income? _____.

Signed _____

Please use the space below for any additional comments you may care to make.